The JOURNAL *of* GEOGRAPHY

Copyright 1939, by the National Council of Geography Teachers

VOLUME XXXVIII APRIL, 1939 NUMBER 4

REINDEER TREK

OVID MILLER MCMILLION
Concord State Teachers College, Athens, West Virginia

PREPARATION

The whaling industry of the Arctic brought disruption to the stable food and clothing supply of the Eskimos in Alaska. Modern weapons rendered uncertain the supply of land and sea animals and birds. The Eskimos faced starvation. Importation of reindeer from Siberia and of Lapp instructors from Lapland solved the problem. Private subscriptions in 1891 marked the beginning; government aid followed. In 1935 Alaska had about one-half million reindeer and can possibly support about four million. By serving as apprentices to the Lapps, the Eskimos became deer owners, but were not allowed to dispose of female deer to whites. The Lapps were not so restricted, so white ownership of deer resulted.

The Canadian government, faced with fluctuations in the food supply of the Arctic Eskimos and seeing a satisfactory solution of the problem in Alaska, contracted with Lomen Reindeer Corporation for the delivery of 3,000 deer at Kittygazuit (gadgit), Canada, in return for $195,000. It was thought that, with this start, Northern Canada could eventually be stocked with reindeer. The company estimated that it would take eighteen to twenty-four months to drive the deer across the country; it took five years. The herd probably traveled 2,500 miles to accomplish the estimated 1,600 mile trip.

A total of 3,440 deer (including 250 deer for draft purposes) were selected in December, 1929, to the east of Kotzebue Sound, in Alaska. Dan Crowley was selected as director of the drive, while Andrew Bahr, a veteran Lapp herder, fifty-five years of age, scarcely five feet in height, and weighing about two hundred pounds, was selected as chief herder.

Lapp and Eskimo wives made clothing for the herders. The

Lapps insisted on their boots with the upturned toes (grass for socks). The inventory for the herders included, in part, sleds, deer harness, mosquito netting, cowbells, candles, flashlights, compasses, and a double tent (willows, etc., to be placed between the two parts when set up). Each herder was provided with a reindeer dog.

Some of the hazards which men and deer would have to face were snowslides, avalanches, exposure, stampeding and milling of herds, attacks from wolves and bears, ice traps, and starvation. The meat supply was to be replenished along the way by caribou, rabbits, ptarmigan, moose, and crippled deer, insofar as possible.

THE FIRST YEAR

On Christmas, 1929, ten men, four Lapp and six Eskimo herders, from a position almost exactly on the Arctic Circle, headed northward with the herd. The idea was to proceed northward over the Baird Mountains, enter the Noatak Valley, cross the Brooks Range, descend to the almost level, treeless tundra along the Arctic Coast, then proceed eastward to Canada. Very few people lived anywhere along this route.

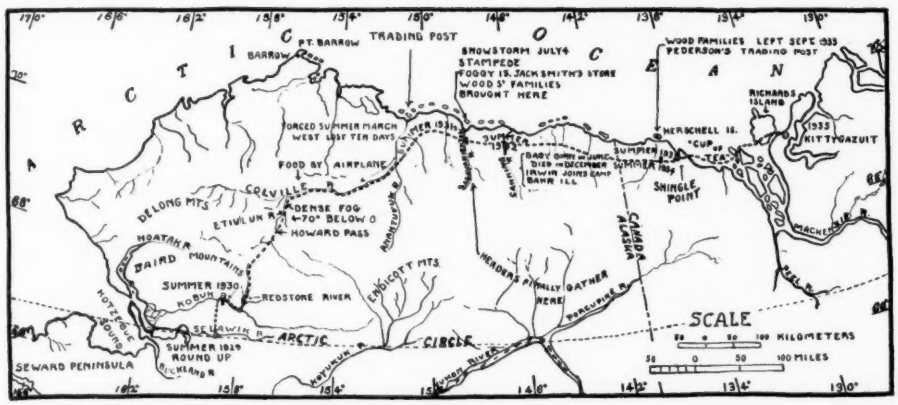
The homing instinct is strong in reindeer. During the drive to the foothills of the Baird Mountains, the herd tried frequently to break back and return to the home range. Deer also feed into the wind, and a strong wind is likely to carry them a long distance in one direction. During the summer of 1930, the deer were herded between the foothills of the Baird Mountains and the Kobuk River. Herders, working in twenty-four hour shifts, were stationed in the narrow neck of open land to the west, between the mountains and the river, so as to prevent their returning home.

A full-grown reindeer is about forty-four inches high and six feet long (tip to tip), will weigh about 250 pounds on foot, and about 150 pounds dressed. The most vigorous animals are steel gray in color, but some are white or spotted. Both male and female have horns.

When excited, they sometimes mill, whirling about in a circle, with the weakest deer in the center. Bear attacked the herd on the Kobuk River, while wolves were especially bad on the Arctic Slope. They took advantage of storms and fogs, and killed many deer. Deer stampede at times, rushing pell-mell in some direction. Altho they depend on mosses (lichens) for winter food, they eat a variety of vegetation in summer, but refuse oats and other cultivated foods. Care must be taken not to overstock the ranges. It takes lichen areas

about twenty years to regain their former condition after being swept by a fire.

There is little trouble from mosquitoes when a breeze is going. Heretofore, when mosquitoes and warble flies descended in the summer, the deer rushed to the ocean breezes and the soothing salt waters for relief from the insects, but the Kobuk Range was too far inland for this. Whereas the herders wore gloves and black mos-



quito netting for protection, the deer must get along as best they could. The writer has seen Alaskan dogs with eyes swelled shut, so vicious were the attacks of the insects. Black swarms settled on the deer. They became so desperate that half the herd stampeded across the Kobuk River to the south. There was no use in going after them, so the herders merely kept a strict watch over those remaining. However, the spring fawning proved so successful that even more were returned to the home range.

ACROSS THE MOUNTAINS

From an airplane inspection, the Redstone River Route appeared more favorable than the Hunt River Route for pushing the herd into the Noatak Valley. In December, the herd was moved in darkness thru this frozen gap of the Baird Range. Herders signalled to each other with flashlights. Supplies had previously been landed in the valley by airplane so as to do away with the necessity of sledding by dog team. A dog team had been purchased on the Kobuk.

The herders pushed ahead for Howard Pass, the route thru the Brooks Range to the north. It was felt that, once over this, the worst part of the trip would be over, the rest being long, but comparatively easy-going. The pass, itself, was at an elevation of about 5,000 feet,

while some of the surrounding mountains were about 9,000 feet high. Terrific Arctic blasts swept southward thru the pass. Some Alaskan residents predicted that the herd could not be driven over this range to the Arctic Slope.

In the succeeding push, some deer were swept off their feet by the fierce winds, and others were actually pushed or pulled, at times, thru the long pass. Tired men and deer finally arrived on the Arctic Slope, thankful that the difficult mountains were now to the south.

DOWN TO THE COAST

However, their worries were by no means over. For fuel, the men were first reduced to an uncertain supply of twigs gathered during the herding, and later to nothing. They perspired in their clothing, and it froze; it could not be thawed out. The movements of the men became difficult. They had no warm food, but the pilot bread and the condensed milk failed to freeze. Men, dogs, and clothing were crowded into a tent fourteen by sixteen feet. Tent pegs were burned; sleds were used for tent props. Men nursed frost-bitten toes and, with frost-bitten fingers, repaired their boots and suits. Finally, on the headwaters of the Etivluk River, a herder found a little coal, and the men had fires again. When they eventually reached the coast, driftwood, found under the snow, provided them with fires.

North of Howard Pass, the thermometer dropped to seventy degrees below zero. Men exposed flesh only when absolutely necessary. Even fire-building was dreaded. The cold atmosphere became a misty white; the herd traveled in an enveloping fog. The frozen moisture had to be brushed from the eyes of the sled deer, from time to time, so that they could see to proceed. The frosted snow clung to the runners of the sleds and rendered travel difficult. Sled dogs died, and reindeer dogs did double duty. Men had to peer to see each other and give warning of frost-bitten faces, for this tell-tale tinge could be seen by others more readily than felt by the person concerned. The wolverine trimming which fringed the hoods about their faces was a great help. Wolverine does not collect frost and snow as other furs do. The men slapped their faces with their mitts to keep circulation going. They followed the fog cloud which obscured the deer. The click-click of the tendons in the hind legs of the deer, plus their voices, like that of grunting pigs, kept the men company.

During all this time they must find pasture ground. Skis and

snowshoes were found useful in traveling. They must reach the coast, where there were a few trading posts, before the spring thawing, or they would become bogged down in the tundra and run short of supplies. It was in March (1931), on the Colville, that Joe Crosson, an aviator, on a trip from Fairbanks to Point Barrow, saw the herd below. This was the first time the company had heard of the herd since its departure from the Kobuk the fall before. The aviator was paid $250.00 to land and contact Bahr. Bahr requested food. It was landed later by airplane—1000 pounds for $1000.

Winter traveling is done almost wholly by night north of the Arctic Circle. However, when the weather permits, the Arctic dweller is aided by the Northern Lights playing overhead, the white snow cover, the stars in their brilliancy, and the moon in its lighter stages. There were times when stormy weather blotted out everything and the herd traveled in the dark.

The question of food was always a weighty one—food for man and deer and dog. The men could, if necessary, resort to a meat diet, but the deer must be kept on ground clothed with moss. It is said that deer can scent moss knee-deep under the snow. The spring fawning season and the summer waiting period demanded a stop where there was plenty of food. Inasmuch as the ground was covered with snow during the winter period, it was not always easy to find satisfactory feeding grounds. In addition, little was known of much of the country thru which they were traveling, altho an airplane reconnaissance had been made of the route.

Travel must, of necessity, be limited to the winter season. Young fawns must gain strength before traveling far. In addition, when the ground thaws in the spring, the tundra country becomes a land of bogs and currents. The deer can still travel because of the broad hollow foot, but men find travel difficult, almost impossible, especially so with equipment.

When the herders noticed caribou north of the Brooks Range, they knew that there was food for the reindeer. However, another danger presented itself. A large herd of caribou could swallow the reindeer herd and wipe it out as a commercial unit. The men watched for the caribou with six-power binoculars. They would rush to distant herds and frighten them away, even by killing some of them if necessary. The men allowed female caribou to join the herd; they would make good meat as needed. Even if not killed they would inject good blood into the breeding stock, inasmuch as caribou and reindeer readily mix. Male caribou were shot on sight and used as

food. They preferred to visit the herd for a day or two and then depart, followed by female admirers.

THE FORCED MARCH

The herd was halted on the waters of the Itkillik River for the spring fawning season. However, it soon stripped the country of its food, and men were forced, in summer, to find better feeding grounds. They left the sleds on the Colville River, and, after loading sixty-pound packs on the backs of the sled deer, marched eastward over the boggy tundra. Fog was so thick that the men were unable to keep together. The Eskimos were given instructions to look after the herd, the Lapps were to look after the sled deer, and no one was to camp until he came to a stream where there was driftwood for campfires.

Typical of similar experience, Ivar West, a Lapp herder, a man about fifty years of age, was lost for about ten days on this trip.[1] Each man had been instructed that, in case he became uncertain about his way, he was to work eastward and toward the coast, rather than inland. The driving was done about ten to twenty miles in from the coast, this being considered the more favorable route. Each man was supplied with a compass, but the Lapps place more trust in stars. It became too cloudy for West to check his compass against the stars, so he chopped a circle about a "niggerhead" (a hump of frozen tundra), tied his deer to it, and took a rest. He awoke to see his sled deer, pack and all, disappearing with some caribou cousins. After many hardships he found the herd.

The stragglers, both herd and herders, finally reached the waters of the Sagavanirktok River. Here they found driftwood and made a permanent camp for the summer (1931). A blinding snowstorm on the Fourth of July actually delayed the men a year. Half the herd, possibly 1000, stampeded west. Herders were sent after them, but a two weeks search proved unsuccessful. Bahr had the sleds, which he had left at the mouth of the Colville, sent around by water during the summer, and, in November, took part of the remaining herd as a decoy, and went back after the lost deer. Supplies had been replenished from coastal trading posts, and new herders had been obtained to replace ones which were unsatisfactory or had quit.

[1] The story of Ivar West, as well as some of the other information contained in this manuscript, may be found in greater detail by referring to Max Miller, *The Great Trek,* Doubleday, Doran and Company.

Low Tide

Bahr returned with what deer he could find and rejoined the advance herd west of the Canning River in April (1932). Summer camp was made on the Canning. Coal in this coastal region rendered less necessary the dependence on driftwood.

The Wood brothers, Peter and Tommy, Eskimo herders, had previously requested that their wives be sent to them. They were brought around from the Kotzebue region to Foggy Island by boat (1931). In June, 1932, a baby was born to Peter's wife. It died in December. In September, Bahr became violently ill, and it was feared he would not live. One of the herders blamed it on soured oranges. At this time, Dave Irwin, the man who shortly afterward was credited as the first man to make the trip afoot across northern Canada, came in from the ocean and joined the herders. Irwin relates that, during a night when rations were running short, he and Bahr were awakened by a scuffle. An Eskimo herder, knife in hand, was caught in Bahr's tent by Peter. Bahr had considerable trouble with his men at times. Irwin states that the Eskimo herders were so jealous of him because he could herd as well as they that he quit the drive, thinking that his presence might cause Bahr to have trouble with his men.[2] (It is interesting to note that Eskimos are called "Huskies" in northern Canada.)

Blocked by Water and Ice

During the succeeding winter (1932), the herd was pushed to the left bank of the MacKenzie River, but had to wait until the winter freeze-up for the crossing to Kittygazuit. Great blizzards coming out of the cold north tormented the men as winter came on. Deer could not be driven across the low-lying lands of the MacKenzie Delta because they were covered with willows. Deer cannot be driven thru timbered country. They were to be driven across the seventy-to-one-hundred-mile-stretch where the MacKenzie's various tributaries empty their waters into the Arctic Ocean. The herders were forced to wait for water to freeze and for snow to fall.

On the arrival of the herd in Canada, Lapps, hired by the Canadian Government, joined the drive. The Wood brothers, with their sick wives, went home in 1933. Of the original ten who started on the trek, two remained—Edwin Allen, an Eskimo, and Bahr, chief herder.

[2] From David Irwin, *Alone Across the Top of the World*. By permission of the John C. Winston Company.

Storms prevented moving of the deer by moonlight on December 22 (1933). On January 3 (1934) they were pushed off the tundra in darkness for a first sheer 35-mile stretch on the ice to the first island. The herders traveled continually all that day and night. Smelling the tired odor of the deer, the herders, also very tired, halted for a hot cup of tea. That stop delayed them another year. The deer stampeded back to the mainland and were in too poor a condition to attempt another crossing that year.

Crowley, director of the drive, had joined the herders on their entrance into Canada. During the summer (1934), he had moss carried in sacks and placed on various islands enroute to Kittygazuit. Later, he staked the route on open ice. The proper snow did not fall until February (1935). After twelve miles of traveling, a terrible blizzard came out of the north, and the deer, for the second time, bolted for the mainland.

SUCCESS

Three days later, under the full moon, the herd was, for the third time, pushed on the ice. At the first stop, while the deer were herded in a narrow channel between islands, a great storm moved in from the north and enveloped men and deer. A few days later, the herders saw Richards Island. The deer could not see it. The tired odor became evident. Deer began to drop. Some scented the moss and weakly walked or wobbled toward it. Some dropped and were carried. During the night, the wind swept the ice clean of snow. Had this happened a day earlier, the deer and men would have been marooned, for deer cannot travel on clean ice; they slip and fall.

After a week's rest, the herd was delivered to the Canadian Government at the Kittygazuit corrals (March 6, 1935). There were 2,370 animals: 1,498 females, all ages; 289 bulls and yearlings; 322 male fawns; 261 steers. Only 10 per cent of the deer which started in Alaska completed the trip.

The deer are under the Department of Mines and Resources. The Canadians are copying from Alaska in the management and care of the herd. The herd is taken to Richards Island for the fawning season in April and May and is driven back to the mainland for the winter. The average weight of dressed animals has increased about fifteen pounds since the arrival of the deer in Canada. New born stock causes the herd to become attached to the local range. By 1937, the herd had increased to over 4,000. It is estimated that between the Coppermine and MacKenzie rivers about a half-million

reindeer can be supported, with possibly eleven million deer in all of Canada.

It appears that a steady meat diet and a source of clothing and other necessities is thus assured the Canadian Eskimos of the future. With deer, he will not have to worry about the uncertain supply of whales, caribou, seal, fish, walrus, and fur during the long desolate winters.

SOUTHEASTERN ASIA

Florence E. Brown
Fifth Avenue High School
Pittsburgh, Pennsylvania

Type of Class: This unit was used with Seven B mixed group. The time taken was one week.

Unit of Work: Why Southeastern Asia has a denser population than other land in the same latitude.

Objectives:

A. To learn why Southeastern Asia has a greater population than other lands in the same latitudes.
B. To see the relationship existing between the products and occupations, and the natural environment.
C. To be able to account for dense population in parts of Southeastern Asia, and the sparse population thruout other regions in the same latitude.
D. To realize the part Southeastern Asia plays in our rubber and canning industries.

Core of the Geographical Unit on Southeastern Asia

The major understanding to be acquired is why Southeastern Asia has a greater population than other lands in the same latitude. The geographical understandings to be gained from the study of Southeastern Asia are a realization of the dense population in Java, along the coasts and in the river valleys, and the sparse population in the interior; the importance of rubber growing especially in Malaya, Sumatra, Java; the importance of mining, especially in Malaya and small islands southeast of Singapore, and lumbering in the forests; the importance of agriculture, especially in the river valleys of French Indo China, and in the coastal lowlands; how the

products of these kinds of work enter into the foreign trade which centers at Singapore; how the industries are related to a natural environment whose outstanding characteristics are forests, agricultural land and resources as tin; location in the low latitudes, with continuous high temperature, abundance of rain evenly distributed, or in some places much rainfall in the wet season, the occurrence of the showers in the afternoon and no strong destructive winds; a core of rough and mountainous surface with rich lowlands along the coast and in the river valleys; its position between the European countries and Southwestern Asia, and China and Japan, commanding the Indian Ocean, and on the great steamship routes; the difference between the rainfall and temperature of the United States and Southeastern Asia.

I. Introduction

A. To introduce the study of Southeastern Asia, have physical, trade route, climatic, and population maps; text and graf of Pittsburgh temperature and rainfall.

B. Procedure

Southeastern Asia has a population of about seventy-five million people. From the study of these maps, suggest some reason for this density. List the things given by the pupils, as climate, surface, transportation, position, etc.

May Study.

What is included in our text in Southeastern Asia? (Have these located on the map, and put on outline map.)

Where are most of the people distributed?

Why is most of the population here? (Physical map. Coastal plains with backbone core of mountains.)

How does the density of population in Southeastern Asia compare with the density in the United States?

Every day in the year in the afternoon the temperature ranges between eighty to ninety degrees. Why? (Equator and land lying in the low latitudes.)

Would this be an advantage or disadvantage? (Advantage, because food can be grown the year around to feed the people.)

(Show graf of temperature of Pittsburgh.) How does Southeastern Asia compare in temperature with Pittsburgh?

What other factor is needed in considering the density of population? (Rainfall)

What is the average rainfall?

Show rainfall map of Pittsburgh. How does this compare with the average rainfall in Southeastern Asia?

Show trade route map. What conditions give Southeastern Asia its importance? (Located on the shortest sea route between any point of Eastern Asia, on one hand, and any part of Southern Asia or of Europe, on the other.)

How do other lands in this same latitude compare in rainfall? In surface? In population? What question does this population map suggest?

Pupils state their own problem:

"Why has Southeastern Asia a greater population than other lands in the same latitude?

From the text or supplementary books, list the ways the people make a living.

How do the ways of living affect the people of the United States?

List agricultural products named in the text.

Which two lead in importance?

List important mineral products that are found. Which is the greatest of these?

List forest products. Which would you consider the most important of these?

We shall take the study of the important products which you have named to see if these influenced the density of population.

II. Development

What important products are found here?

A. The picture entitled "Rubber" is shown

This moving picture (including map) shows the great rubber producing regions of the world, giving the amount produced in each, the gathering, preparing, and shipping of rubber. It also shows the loading of the boxes containing rubber and also the loading of the latex into tanks at Singapore to be taken to New York. The journey to New York is shown.

A map of the "Journey of the Hevea Seeds" is also shown.

A lantern slide showing specific places where rubber is produced, and maps are used.

The following questions were given to the children to find out the answers from the picture and maps.

From the title, what would you say would be one of the reasons for the denser population?

From where were rubber trees introduced into Southeastern Asia?

Where are the rubber trees found? (On borders of Malay Peninsula, the part of Siam which extends into Malay Peninsula, on northeastern and southeastern part of French Indo China, and near the coasts of Netherlands Indies.

Why are they found there?

What in the picture suggests the temperature? (Clothing)

What does the picture suggest about the working conditions and the homes? How might this be a reason why people are willing to come from other countries here?

What are the men doing? How is the latex secured? How is it prepared?

To what city is it sent? (Singapore) Why?

Where is much of it sent from there? Why? (The rubber industry is one of the reasons for the denser population. The fact must be brought out that 300,000,000 trees on the large plantations owned mostly by the British and Dutch, are closer together than the wild rubber trees in other lands of same latitude, the plantations are more accessible to the ocean, and better labor and sanitary conditions and better transportation facilities exist. About ninety per cent of the world's rubber is produced here, so more people are needed. Besides the native population, millions of Chinese have migrated here to carry on business and thousands of Indians have come to work on the rubber plantations, where conditions are better than in crowded countries from which they came.)

Latex is shown. What does this resemble? (Milk. It is pointed out that latex is the milk or juice of the bark and not a sap.)

Demonstration by a pupil of making of rubber by put-

ting acetic acid into the latex. Demonstration of tapping of trees.

Show samples of sheet, smoked, and crepe rubber.

Pupils put approximate rubber areas on the map.

Summary:

Discussion of introduction of plantation rubber, comparison with old industry in South America, our relation to the industry, why this has become the world's most important source for rubber, and why more people are here.

B. Salmon, tuna fish, certain fruits, are sent from our western states to all parts of the United States. How can these best be sent?

The United States must get tin from other countries for its supply is negligible.

A graf is shown of the tin producing countries.

The following are questions for the children to find the answers from the graf or the text.

What are the great tin producing countries?

Which are the greatest countries?

In Barrows and Parker, page 225, is a picture of tin mining.

How are they mining? Why? (This is not the only way to mine.) Name some other ways.

Do you recall any other places in which they mine like this? Where?

Where is the tin smelted? Why?

What places does it mention mining tin? Find these on the map.

Since the largest tin mines in the world are here, how would the mining of tin affect the density of population?

Put the tin areas on an outline map.

C. Another reason for the density of population is shown by this picture. (Picture of rice planting.)

What are these people doing?

Is this taken in a high or low latitude? Why?

Where is this work being done? Why? (On lowland along the coast, as we learned from map study that the lowlands were along coast and the mountain core in the interior.)

Why is it possible to grow this here? (Summarize geo-

graphical factors.) Emphasize with the other geographical factors that much rice is grown thruout the year, so a greater number of people can be supported.

What other countries have same natural conditions so that rice may be grown?

Discussion of rice culture, and why there are more people.

From given statistics make a graf of rice producing countries.

Read in the text and supplementary books, and answer the following questions:

What two countries are named as the great rice producing countries?

Where is most rice raised? Why?

What city exports rice? Why?

What island raises much? Why?

Read to the class:

Bangkok, in the delta of the Menam, is the leading city for exporting teak. Teak is a typical tree of the kind of tropical forests found in the monsoon regions.

Show teak and oak.

How does the teak differ from the oak?

What are some of the uses of teak?

Why used in this way?

Large numbers of teakwood logs are cut in the forests, and elephants are used to carry them to the Menam River.

Why do they use elephants?

The logs are put on bamboo rafts to be sent down stream. Why?

To what city do they think the teak would be sent? Why?

What other forest product is mentioned on page 226, Barrows and Parker?

To what city is this forest product sent to be stripped? Why?

Discussion of how these products enter world trade and so give more work to the people.

III. Summary

Restate briefly the facts which show that Southeastern Asia is more densely populated than other regions in the same latitude.

IV. Assignment

From the text or supplementary books, make out a set of relationships giving first the human factors and opposite them the environmental.

After the study of the assignment, a test is given.

Activities summarized:

Filling in outline map of countries and islands. Locate equator.

Making of rubber by adding the acetic acid to the latex.

Filling in outline of countries and islands, locating where tin and rubber are found. Locate Singapore. Also trace steamship routes, stopping at Singapore, and then the journey to New York.

Making of grafs, from statistics showing countries which produce rice.

Reading in the text for answers to questions.

Boys demonstrated the tapping of the rubber trees.

Making out relationships between man's activities and his natural environment.

Testing Period.

Mimeographed maps of Southeastern Asia are given to pupils. Each country or island has a number on it. Three parallels are placed on the map.

I. Write the names of the countries in which you find numbers beside the corresponding numbers below: (Numbers placed on testing sheet from 1 to 7.)
   1. Put a × where the city of Singapore is located.
   2. Draw a line along the equator on the map.
   3. Print the word "tin" in the territory in which it is found.
   4. Place the approximate locations of rubber area on the map by shading with your pencils.

II. Rearrange pictures of rice production in sequential order. (Seven pictures are shown that are numbered.)

III. Completion Test.
   1. The leading forest product of Siam and Indo China is .....
   2. Among these countries, ... is the only one that is independent.
   3. The United States consumes ..... (state in a fraction) of the world's supply of crude rubber.
   4. In making of tires, the United States uses ..... (fraction) of the total amount it imports.
   5. The chief rubber producing areas of the world are:

      a.
      b.
      c.
      d.

6. The manufacture of the ..... greatly increased the importance of the rubber industry.
7. Singapore is the important city in Southeastern Asia because
   a.
   b.
   c.
   d.
8. Akron is an important rubber manufacturing city because
   a.
   b.
   c.
   d.

IV. Multiple Choice

Underline the correct word:

1. The most densely populated section of Southeastern Asia is Siam, Java, Malaya, Sumatra.
2. The most important raw material for manufacture in the Malay Peninsula is wool, cotton, rubber, jute.
3. Most of the tin used in the United States comes from the mines in
   1. China and Siberia
   2. British Malaya and Netherlands Indies
   3. France and German
   4. Bolivia
   5. Alaska
4. The greater part of population in Siam lives
   1. On mountain slopes
   2. In the inland plains
   3. Along the banks of the Menam
   4. Higher up the mountains
   5. Rattan stripping is done in Borneo, Singapore, Sumatra, Java.

V. Relationship Test.

Match the proper human activity responses to the set of geographic conditions explaining it.

1. The growth of a very important city. ( )
2. Rice is an important crop. ( )
3. Rubber plantations in Southeastern Asia lying mostly in belt of ten degrees north and ten degrees south of the equator. ( )
4. Java contains nearly three-fourths of the population of the Netherlands Indies. ( )
5. Wooden steep thatched roofed houses of Indo China, raised on posts. ( )
6. Other lands in the same latitude with Southeastern Asia less densely populated. ( )
7. Most of the people of Southeastern Asia live near the coast. ( )

1. Undulating, fertile plain, tranquil Straits of Malacca, sheltered part way by Sumatra, not exposed to strong winds or stormy sea.
2. Temperature and rainfall not suitable for growth of rubber.
3. Palm trees the fronds of which make fine thatch and long grass, much rainfall, forests.
4. Lands great distance from the sea.
5. High temperature, deep soil of good texture, easily penetrated by roots, heavy rainfall, mostly evenly distributed, no marked dry season, destructive winds practically unknown.
6. Rich volcanic soil, plenty of rain, abundant sunshine, warm coastal lowland.
7. Ore near the surface, mixed with clay, sand, gravel.

8. More people live on the west side of Malaya than on the east side. ( )
9. Hydraulic mining of tin near Singapore. ( )
10. The United States gets the rubber it manufactures from Brazil and Middle East. ( )

8. Position at the turning point on one of the great seaways, excellent harbor, on the shortest sea route between eastern Asia, and southern Asia and Europe and located near the rich Netherlands Indies.
9. Occasional drought.
10. Long growing season, abundant supply of water for irrigation, fertile warm lowlands.

Materials used:

Maps: temperature, rainfall, population, physical maps
Steamship routes
Grafs: temperature of Pittsburgh and rainfall of Pittsburgh, rice
Slide: showing place where rubber is produced
Moving picture
Pictures
Specimens: latex, kinds of rubber, and teakwood
Text: Barrows and Parkers, Supplementary books

Books for Children

Allen, N. B., Asia, 339, 373-76, 381, 382
Atwood, W. W. & Thomas, H. G., Nations Beyond the Seas, 90-94
Barrows, H. H. & Parker, E. P., Europe and Asia, 223-229
Dodge, R. L. & Lackey, E. E., Elementary Geography, 300-305
Dodge, R. L. & Lackey, E. E., Advanced Geography, 391-396
Huntington, E., Asia, 284-303
Keller, A. G. & Bishop, A. L., Commercial & Industrial Geography, 85-101
Martin, John, Rubber, A Wonder Study, 1-22
McMurry, F. M., & Parkins, A. E., Advanced Geography, 426-437
Smith, J. R., Human Geography, Book II, 340-344

Magazines for Children

Reid, W. A., Commodities of Commercial Series, No. 10, A Brief Talk about Tin, 3-21
Reid, W. A., Commodities of Commercial Series, No. 15, Rubber 3-31

Books for the Teacher

Bowman, I., The New World, 23, 24, 25, 490-92

Huntington, E. & Williams, F. E., Business Geography, 165-79
Stamp, L. D., Asia, 373-444.
Whitbeck, R. H. & Finch, V. C., Economic Geography, 489-503
Figart, David, The Plantation Rubber Industry in Middle East, 1-268

Magazines for the Teacher

Aston, G., Singapore, *Nineteenth Century,* Vol. 95 (April 1, 1924), 502-11
Casey, R. J., Four Faces of Siva: The Mystery of Angkor, *The National Geographical Magazine,* Vol. 54 (Sept. 1928) 303-332
Gaunt, G., Singapore, *The Nineteenth Century,* Vol. 94 (Sept. 1923), 359-62
Moore, R. W., Along the Old Mandarin Road of Indo China, *The National Geographic Magazine,* Vol. 40 (Aug. 1931), 157-201
Moore, R. W., Thru Java in Pursuit of Color, *The National Geographic Magazine,* Vol. 44 (Sept. 1929), 333-363
Scammell, J. M., The New British Base at Singapore, *Current History,* Vol. 19 (Oct. 1923), 114-18
Simpich, F., Singapore, Crossroads of the East, *The National Geographic Magazine,* Vol. 49 (Mar. 1926) 235-69

An increasing number of upper air observations are making possible a higher percentage of accuracy in the daily United States Weather Bureau forecasts. Already there are six Weather Bureau, two Army, and two Navy radio-sonde stations in the United States. At each station the radio-sonde, also known as the radio-meteorograph, is sent up in a balloon, measuring five or six feet after inflation. This balloon rises at a rate of about 1300 feet a minute to a height of nearly 15 miles where the balloon bursts letting the instrument to earth by parachute. Finders return the instrument to their nearest Weather Bureau station and receive a small award for its return. The radio-sonde transmits radio signals which indicate air pressure, temperature, and relative humidity every few hundred feet. These signals are picked up at the ground station and help the forecaster anticipate weather changes. In the past, an air mass analysis was obtained only from some twenty daily airplane ascents to altitudes of about 16,000 feet, or from pilot balloon ascents with self-recording instruments, the readings of which were not available until the instruments were found and returned to a nearby station. This delay often made the facts of little value to the daily forecaster. The farmer, aviator, engineer, and general public will be greatly benefited by the increasing use of the radio-sonde which has been developed by the National Bureau of Standards.

HENEQUIN: THE GREEN GOLD OF YUCATAN

C. LANGDON WHITE and EDWIN J. FOSCUE
Western Reserve University
Southern Methodist University

The greater part of the world's commercial crop of henequin is grown in northern Yucatan, south and southeast of Progreso and Merida (Fig. 1). Henequin means to Yucatan what sugar does to

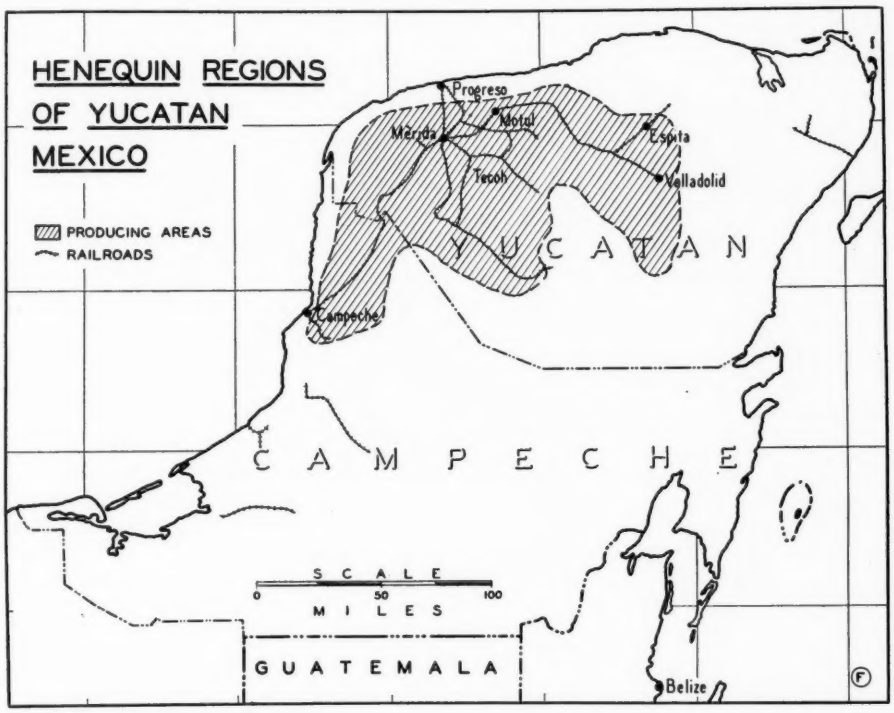


Fig. 1. Yucatan—henequin garden of the world. Here is produced most of the fiber for the twine that binds that portion of the world's grain which is harvested with the reaper. Railways have been built thruout the area for carrying the dried fiber to Progreso. (Data for map from L. H. Dewey, Botanist in charge of fiber plants, U. S. Department of Agriculture)

Cuba, and coffee to Brazil. Since it has done for Yucatan what gold has done for other wilderness regions, the natives call it "green gold."

CLIMATE AND SOILS

Production is centered in Yucatan because its climate and soil are ideal for henequin and, in addition, it is near the United States, the world's largest consumer of binder twine. The climate is hot,

dry, quite clear, and frost-free. While the region annually gets more than thirty inches of rainfall, mostly from May to October, most crops would suffer from drought because the rate of evaporation is excessive and because the rainfall sinks almost immediately into the porous soil. Thus, to the traveler, the country looks arid.

The soil is almost everywhere stony, which insures the drainage which henequin requires. In some places, where soil is entirely lacking, each plant is set in a hole blasted out of solid rock and may need to be supported by pebbles until the roots can penetrate the rocky surface. Such a condition would be fatal to most crops, but henequin thrives on it. So productive is this crop on these stony soils that many planters believe henequin will fail or at least not thrive on deep fertile soils. Experiments, however, on good soils in the state of Tamaulipas have proved the fallacy of this belief. It is the cost of weed eradication on fertile soils that makes henequin production unprofitable. Hence the stony fields of Yucatan and Campeche aid man by restricting weeds to a minimum; only the very hardiest weeds make an appearance, and they are successfully destroyed with machetes and picks.

CULTIVATION AND PROCESSING

Once the crop is planted it needs little cultivation. The plant is long-lived, being replanted every 15 or 20 years and bearing two crops of leaves annually. For years it has been grown only on large plantations under the capitalistic system, as it was thought it could not be produced profitably on small farms.* To prosper, a plantation must have at least 300 acres in bearing plants, with about 960 plants to the acre. This large scale production is necessary to permit the plantation mill continued operation thruout most of the year. Fortunately this is possible, since harvesting is carried on more or less continuously.

When the plant is six or seven years old the lowest tier of leaves droops, a sign that the fiber has attained its maximum strength

* The recent Mexican Agrarian Law, tho it may ultimately revolutionize the social aspects of the henequin industry, has not so far changed the plantation system of growing the crop; according to the law, however, the large landholdings devoted to this crop must be broken up. Each affected owner is to receive 360.65 acres of fiber-producing land and a similar acreage of uncultivated land. The terrain expropriated is to be parcelled out among the small farmers (ejidatarios)—each receiving four hectares or 9.884 acres. Since 1935 the independent farmers have made virtually no new planting whereas small farmers have planted thousands of acres. (Charles H. Taliaferro, American Vice Consul, Merida, Yucatan, Personal Communication.)

and that the leaves should be harvested. The worker then cuts the inch-long terminal spine from the leaf. He severs, one at a time with a machete, the fifteen to eighteen drooping leaves, cutting two tiers at each harvest (Fig. 2). He removes from 3000 to 4000 leaves a day and is paid according to the number he sends to the mill. Each

Fig. 2. Harvesting leaves from the henequin plant in Yucatan. The leaves are cut one at a time and two tiers at each harvest. (Photo courtesy Bureau of Plant Industry, U. S. Department of Agriculture)

severed leaf is picked up by another worker who trims off the marginal prickles, and ties the leaves into a bundle of about 40 to 50 leaves. Another laborer then carries these bundles, each weighing from 50 to 100 pounds, to a plantation tram railway which delivers the bundles to the centrals or mills within twelve hours after cutting (Fig. 3). The leaves are then fed sidewise to a machine which

is little more than a series of knives fastened to a drum which separates the long tough fiber from the waste. About 96 per cent of the weight of the leaves is waste.

The moist fiber is then washed and hung in the bright sunshine (Fig. 4). The time required for drying depends on how thinly the fiber is spread on the wires and on the weather, but it usually takes from six to twenty hours. A mechanical drier accomplishes it in twenty minutes. From 700 to 1200 pounds of fiber are secured from an acre of henequin. The dried fibers are then baled in lots weighing 375 to 500 pounds, and are shipped to the United States, where they are made into binder twine. Undoubtedly, the fibers would be manufactured into binder twine in Yucatan were it not for our high import duties on twine. Our normal annual consumption is 150,000 tons.

Fig. 3. A harvester's assistant carrying a bundle of leaves from a Yucatan plantation to a tram line whence it, with many others, will be shipped to the mill. Such a bundle contains from 40 to 50 leaves and weighs from 50 to 100 pounds. (Photo courtesy Bureau of Plant Industry, U. S. Department of Agriculture)

TROUBLED HORIZONS

Yucatan has a virtual monopoly on binder-twine fiber, producing about 80 per cent of the world's supply. Botanically, henequin and sisal are not the same, being distinct species of the genus *Agave*, a type of century plant. Despite their resemblance, henequin differs from sisal in that it endures drought more effectively, has thorns on the leaf edges, is gray and not dark green in color, has thicker leaves, is confined almost exclusively to the Yucatan Peninsula, is longer lived, produces a larger percentage of fiber, makes cordage of lower quality, and is suitable for little else than binder twine. True sisal and Philippine abaca are superior but cost more and hence are far less practical for a cheap commodity like binder twine. During the World War, when normal shipping was completely disarranged and sisal and abaca could hardly be obtained,

Yucatan gained control of the binder twine fiber supply, increased the price and reaped a "golden harvest." This ended, of course, when other fibers once more entered trade channels.

Yucatan's tranquillity is threatened, however, by the increased use of the combined harvester-thresher, which is now displacing the self-binding reaper in many great wheat granaries of the world. A more widespread adoption of the "combine" will naturally result

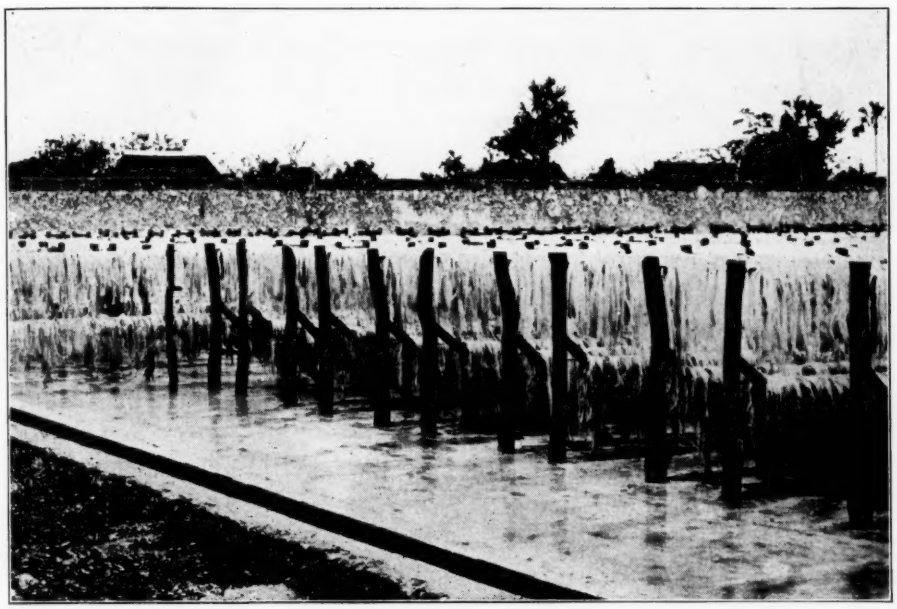


Fig. 4. Drying henequin fiber in Yucatan. The fiber is taken directly from the cleaning machine to the galvanized wires which are stretched above a cement platform the purpose of which is to keep the fiber clean. With clear weather and thin spreading, as shown here, the fiber dries in a day or two. (Photo courtesy Bureau of Plant Industry, U. S. Department of Agriculture)

in a reduced demand for henequin. Moreover, larger quantities of true sisal are being grown in Kenya Colony, Tanganyika, Portuguese East Africa, Senegal, Dahomey, the Bahama Islands, India, Sumatra, Haiti, Java, and Hawaii, thereby competing seriously with Yucatan henequin. The future may see the "green gold" of Yucatan become exhausted as metallic gold has in many parts of the world. Should such a thing happen, the now prosperous Yucatan would be shaken to its very foundations, for it is a one-crop region, and its ability to shift to other crops is restricted by the defiant climate and soil.

THE OLD AND THE NEW OIL FIELD COMMUNITY

EDWARD E. KESO
Central State Teachers College, Edmond, Oklahoma

VISIONS OF RICHES

Everyone owning land near to an area where oil has been discovered has visions of his farm land being covered with derricks and millions of dollars flowing into his purse. Many stories have been told of the great riches to be derived from oil from a small investment. A survey of those making millions in oil, however, will show that the number is very small, and that the chances are against anyone getting wealthy in the oil game.

In the early history of the oil industry, drilling for oil was largely a hit and miss method. Some promoter would have stock issued on an area where he guessed that there might be oil. He would then sell the stock to unsuspecting persons (usually in some other state) who had no idea of how much stock had been issued and sold. When he had sold sufficient stock to cover drilling operations he would employ someone to drill the well. If he wanted more money he might notify the stockholders that more money was needed to finish drilling operations. This usually brought him more money to continue operations. In case the hole drilled produced no oil everyone lost except the one who had sold the stock. If the "wildcat" well produced oil, the promoter who had reserved the greater part of the stock had control of the company, and likewise the greater amount of the profits.

Oil is found in pools, or rather oil producing sands, near the top of an anticline. Natural gas which is usually found with the oil is mixed with or is above the oil in the producing sand. Some wells that produce considerable gas and little oil are known as gas wells. Oil is usually found in strata of rock of a particular geologic age. The early method of finding oil was to find the depth of that strata of rock and drill the well hoping to strike oil. The invention of the seismograph which attempts to locate the oil pools by means of soundings has greatly improved the methods of prospecting for oil, however, even with the use of the seismograph many dry holes are drilled.

LEASING THE LAND

If an area of land is thought to be likely to be oil bearing, the land is leased by oil companies. The usual price for leasing land is

one dollar or more per acre per year for five, ten, or more years. If a farmer does not lease his land, and oil is discovered nearby he may be able to get as much as one hundred dollars per acre for his lease. If the oil company does not drill a well during the lease period, it must re-lease it, or it may be leased to another company. The oil lease merely gives the company the right to drill a well or wells. If oil is discovered seven-eighths of the oil produced goes to the oil company, one-eighth going to the owner of the royalty. This is the usual custom that has been followed since 1906, when our government decided the amount of oil that should be given to royalty owners in the case of the land of the Osage Indians in northern Oklahoma, which was owned by that tribe and handled by the Secretary of the Interior. Oil royalty is usually sold by the acre. If a good producing area is discovered, royalty may sell for five or ten thousand dollars an acre. In some cases fractional parts of an acre are sold, bringing a higher price this way than if sold by the acre.

Methods of Drilling

The early method of drilling an oil well was similar to that used in drilling an ordinary water well, that is, a drill attached to a cable was used, the weight of the drill falling a short distance gradually drilling the well. Casing was set into the hole to keep loose rock or sand from falling into it. Due to the weight of the cable this method was practical only for shallow wells, and was not very satisfactory for wells over 1000 feet in depth. To remove the drills and set and remove the casing a derrick was set over the well in order to help handle the long tubes of casing. Wooden derricks of about 60 to 100 feet in heighth were used in drilling the early wells. After wells were drilled deeper, and better steel was made, steel derricks were found to be more satisfactory, and gradually took the place of the wooden derrick. Very few wooden derricks are now being used. The invention of the rotary drill has made possible the drilling of deeper wells. Today the average depth of a well of the mid-continent field is about 6500 feet. Some wells in California are 10,000 feet in depth. As the well is drilled deeper the hole is gradually drilled smaller, the casing being graduated in the same way. Water and mud is forced into the hole and the slush is forced out under pressure. The motive power for drilling and operating the oil well in the past has been the gasoline engine. In the last few years the Diesel engine has been gaining favor because of more economical operation.

Spacing of Wells

During the early history of the oil industry no set spacing of oil wells on a lease was practiced. If several companies had small leases in an area the companies would see which one could drill the most wells in order to get the greatest possible amount of oil before the other company would get it. This resulted in having many more wells drilled than was necessary, and increased the cost of production. If oil was discovered upon a townsite, drilling upon city lots caused more wells to be drilled, and resulted in irregular spacing of wells. Due to agreements among the oil companies in many states today only sixteen wells are drilled on one-hundred-sixty acres of land; the wells are then drilled in rows which gives the oil field a checkerboard effect. This causes the field to have a better appearance, and is also more economical to the producing companies.

An Old Oil-Field Town

In many cases, oil has been discovered many miles from a city of any size. If the discovery well proved to be a good producer there was a great scramble by different companies to drill as many wells as possible in the shortest time possible. This created quite a labor and housing problem.

A notice in the daily press that a new field had been discovered was also a notice that work might be secured by many people. However, the number of laborers needed was always much smaller than the number that responded and had hopes of employment. Along with the group that hoped to be employed there was always the group that expected to gain in various ways from the labor and good fortune of others. A mushroom town was soon started for there was a great demand for houses, boarding-houses, and places of business of all kinds. Board and rent reached enormous figures. Houses were thrown together in every conceivable way, without plans of any kind. Many times these towns were built along roads and were commonly nicknamed "Stringtown" until a better name was agreed upon when a post-office was granted to the new center.

In the pre-prohibition era, saloons, dance halls, gambling houses, and motion picture houses were numerous, and were well patronized. Laws were seldom well enforced and lawlessness often prevailed. Prices were high and money flowed freely. Wages paid by oil companies have always been above the average wage scale, and in most cases have been more than the worker had received before

entering this occupation. As new fields were constantly being discovered there seemed to be no need for the worker to save his money, so he spent it freely, and in many cases, unwisely.

If the oil field proved to be a large one the new town grew fast and spread out over quite a large area. Streets followed no set plan but extended in any and all directions. The business section likewise was extended to meet the great demand of varied products. Lots or building sites sold for high prices. Building construction was of the cheap type, for permanence was not desired, and buildings were wanted as soon as possible. Most of the houses were small, containing two, three, or four rooms. Tar paper often served to cover the sides as well as the roofs of the buildings. If the worker was required to stay on the lease he sometimes built his own house there, often from scraps of lumber salvaged from the oil companies. In some cases the oil companies built houses for their employees who were required to stay on the lease. These were three or four room houses, often of the sectional type of construction.

The People

When the oil field was first opened there was usually a much larger proportion of men than women. When the field proved to be a good one the men would send for their families, but the larger proportion of men usually predominated because many of the workers were young, and many others were "drifters" without families. As the town grew, schools were needed. First a small school building was built, only to prove inadequate in a few months. As room and board was high in this community, salaries for teachers were also high; often much higher than in the older communities. Money soon was lavishly spent on school buildings and equipment. Football and basketball teams were demanded. These games were well attended and players were often subsidized. A winning team was demanded regardless of cost. The people of the oil community were usually of old American stock, with a few Jews, Syrians, and Mexicans coming later to share in the profits of business in a growing community. Churches were built later, but were small in number, and as a rule, were poorly attended. Sunday schools for the children fared better and drew many of the children of the community. Some of the occupational terms used in the oil field are—field superintendent, tool pusher, roustabout, gang foreman, roughneck, driller, tool dresser, lease foreman, pumper, and line walker.

THE OIL FIELD COMMUNITY AFTER THE BOOM

After the oil field had been drilled, pipe lines laid and oil tanks located, there was less demand for labor of all kinds. The growth of the city soon also stopped, causing less demand for labor there. The companies soon started laying off men and there was a surplus labor supply. After a few years some of the wells started failing, and in others production was less, while in some salt water appeared and made recovery difficult. As more men were laid off, the situation in the city became critical unless new fields were discovered nearby. The population now was out of proportion to the available work. Many of the men by this time had families or were too old to work. They must live somewhere, and unless they could find work elsewhere they stayed in the community. As they had saved little money, they could buy only a limited amount of products, which caused business in the city to decline. Buildings, many of which had been cheaply constructed and not kept up, soon deteriorated, and gave the city an appearance of being much older than it was. Soon people could not pay the taxes that were voted for improvement of streets, public utilities, or schools. This caused the value of property to decline very fast. When the people left, the houses were sometimes torn down, and some lumber was salvaged for use on nearby farms. If a fire started, whole blocks were sometimes burned before it could be stopped. Houses were sometimes moved outside the city limits to evade taxation, the lots in this case being forfeited because the tax was higher than the value of the lots. With less taxes being collected, schools too, had a hard time operating, the number of children being far out of proportion to the taxes collected.

Shamrock, Oklahoma, a typical example of the old oil field community, boasted a population of 25,000 people, a trade territory of 50,000 persons (within a radius of three miles), and was, in 1916, one of the largest cities in Oklahoma. At that time there were ten large rooming houses, nine two-story hotels, fifteen cafes, six lumber yards, forty mercantile stores, five large supply houses, and numerous small concessions. Town lots at that time were selling for $500. Today this same city is the home of less than 500 people, with perhaps some 300 more in its trade territory. Most of the buildings have burned or have been torn down and moved away. Whole blocks of the original townsite have reverted back to pasture land, with only the remains of old foundations to remind the visitor

that a promising city had existed there not many years ago. The story of this city has been duplicated in a minor way in most all old oil field towns; however, a few that were well located near good land have survived the decline of the oil field, and still exist as trade centers for quite a large area.

The Modern Oil Field

The newer oil fields of the present day present a different situation than those of twenty or more years ago. If a number of companies have leases in an area, they often co-operate in drilling a test well. If it proves that there is oil in the leased area, the various companies often move trained crews of men from other locations to drill their wells; only new crude labor must then be employed. During the boom years of 1914-1924 they were forced to employ any kind of labor that they could get; now they can carefully select their men from the best mental, physical, and moral applicants. Strong men with athletic training, many of whom have a college education are now to be found in the oil field. The greater use of automobiles has made unnecessary the "stringtown" of the past. The workers today can usually find board and room, or houses in a town nearby. This, as a rule, causes a boom in the town or city, but they are better equipped to care for the extra population without too much overbuilding, or other evils that were evident in the typical oil town of the past. Many houses that are built are large and expensive. Farmers who have sold royalty on their land move to the city to retire.

The oil field of today is better kept; the wells are spaced in regular order, which gives it a much better appearance. As soon as a slushpit is no longer needed it is filled and the ground levelled. Trash of all kinds and unused equipment is moved off of the lease or placed in an inconspicuous place. Few buildings are now located on the lease, only those that are absolutely necessary being built. Waste oil, brine and acid that had formerly been allowed to run to nearby ravines and streams, and which so polluted the water that it killed the fish and made the water unfit for use, is now gathered by pipelines and pumped into wells bottomed in porous formations far below the field's producing areas.

Transportation, Storage, and Marketing of Crude Oil

As soon as a new oil field has been proven, the question of transportation, storage, and marketing of the oil must be considered.

In the early history of the industry, if no other provision had been made for storage, it was pumped into an open pond or reservoir until suitable tanks could be provided. The tank farm, which consisted of a number of large steel tanks, some holding as much as 55,000 barrels, was soon constructed nearby. A large ditch or wall of soil was placed around the tank to keep fire from spreading in case the oil in the tank caught fire. The oil is pumped from the well or field tank to the storage tank thru pipe lines that are laid underground. Pipe lines also serve to carry the oil to the railroads where it is shipped in tank cars to other sections of the country, to the refinery, or to the coast, where it is shipped to other parts of this country, or to other countries. In recent years many new pipe lines have been laid from the oil fields of the mid-west direct to seaports, or to the larger cities of the eastern part of the United States. More and better pipe lines have made unnecessary the storing of great quantities of oil in tank farms near the oil field. High rates of taxation on the stored crude oil have also made storage very expensive, so less oil is now stored on the tank farm. Much of the gas that is produced from the well is wasted, altho some is used as a fuel in industry; in the manufacture of carbon black; as fuel for heating homes; or, in the making of casinghead gasoline. The use of gas for fuel is gradually increasing, but the greater amount is still wasted.

The price of crude oil depends upon its quality and upon the supply and demand of the oil products. Some oil is sold to refineries that may be located near the oil field, while the greater amount is piped to the larger refineries of the Gulf Coast, or cities in the eastern part of our country, or is piped to the coast for export to foreign countries.

USES OF OIL PRODUCTS

The uses of oil products are varied and numerous. In the early history of the industry oil was used for medicinal purposes. The use of kerosene for heating and illuminating purposes next caused a demand for this oil product. It was not, however, until the great use of machinery, and especially the invention of the internal combustion engine, that the industry gained major proportions. America, at the present time, not only produces more oil but also uses more oil products than any other nation in the world. This is largely due to our great use of gasoline motors in cars, trucks, tractors, and aeroplanes, and for fuel oil for railroad engines, and Diesel

engines. Today thousands of products are obtained from oil, and it is difficult to see how we could do without it.

PRESENT PROBLEMS OF THE PETROLEUM INDUSTRY

Altho it has often been predicted in the last twenty years that the known supply of oil was limited and would soon be exhausted, the discovery of new fields has always proved that past estimates have been in error. At the present time the known supply of oil, under the present rate of consumption, would last about fifteen years. That new fields will be discovered is entirely probable. What the future holds for us in this regard is merely a matter of conjecture. That oil should be conserved is admitted by all, but the ways in which it should be conserved presents an entirely different problem, upon which people do not seem to agree.

Over-production of oil causes prices to be lowered to a point to which the industry cannot profitably operate. In many cases, if wells are drilled and are not allowed to produce, salt water soon ruins the well. Proration laws and agreements have done much to stabilize the industry, but even these have not been able to stop over-production with the resulting decline in prices, the laying off of workers, or poor business conditions in the oil community. Other problems of the industry are regulation of refineries, better and more complete recovery of oil from wells, an over-supply of filling stations, and prevention of the great waste of natural gas.

According to a release in Domestic Commerce, United States residents spent more than a half billion dollars for foreign travel during 1938. Expenditures of foreigners visiting the United States in 1938 totaled $160,000,000.

The annual meeting of the Nebraska Council of Geography Teachers will be held in connection with the Nebraska Academy of Sciences which will meet in Lincoln, May 5-6. The programs are open to all interested in improvement in teaching geography.

MIDDLESBORO, KENTUCKY

ELIZABETH EISELEN
Union College, Barbourville, Kentucky

Visitors to historic Cumberland Gap pass thru Middlesboro at the foot of Cumberland Mountain on the Kentucky side of the pass. Inquiries elicit the information that the city owes its life to coal and its evident city planning to the British founders. Forgotten is the fact that Middlesboro was to be a steel city and that it was for this purpose that the British invested their money.

LOCATION

Middlesboro is situated in a small basin of approximately fourteen square miles. This plain, at an altitude above sea level of about 1,100 feet, is enclosed by mountains rising 2,100 feet to 2,500 feet above sea level. The mountain barrier is broken in two places: to the east is Cumberland Gap giving a passageway thru Cumberland Mountain into Tennessee and Virginia, while fifteen miles to the north, near Pineville, the Cumberland River cuts across Pine Mountain forming Pine Mountain Gap. Connecting these two gaps and cutting across the Log Mountains is the valley of Yellow Creek, the route followed by the pioneers. In spite of this location on the much traveled Boone's Trail or Wilderness Road, it was not until 1889 that a village occupied the plain. On October 14 of that year the town of Middlesboro was officially founded and the following year it was incorporated.

BRITISH INTEREST

This new city received its name from the English steel city of Middlesborough. The money was supplied by the banking house of Baring Brothers of London, stockholders of the Watts Iron and Steel Company of Middlesborough, England, and many other English capitalists. They had formed the American Association, Limited, with a capital stock of $2,000,000 for the purchase of 86,000 acres of land in Claiborne County, Tennessee, Lee County, Virginia, and Bell County, Kentucky. The interest of the British had been aroused by Colonel A. A. Arthur, an engineer, who visited the vicinity of Cumberland Gap, seeking an area that he might develop.

NATURAL RESOURCES

Colonel Arthur classified iron as the most important mineral

resource of this section. Iron ores outcrop in Poor Valley Ridge running parallel with Cumberland Mountain in Virginia and Tennessee. From Cumberland Gap the ores continue northeast and southwest, but about ten miles to either side of the Gap the ridge ceases and the ore is found in the face of the mountain. The ores are in three beds of stratified hematites.

Colonel Arthur also recognized the value of the coal outcropping in the cynclinal fold lying between Cumberland Mountain and Pine Mountain to the west. This coal field occupies the fold, but except on the flanks of Pine and Cumberland Mountains, tilting is not sufficient to add to the difficulty of mining.

The coal measures are approximately 2,000 feet thick, containing more than 30 coal horizons. Of these 10 have since proved of principal importance. The coal is a high grade bituminous with comparatively low moisture and ash content, and is exceptionally low in sulphur. The seams have been exposed by stream cutting, so drift mining is possible. The location also eliminates the problems of drainage and ventilation, and gravity can be utilized in transferring the coal from the mines to railroads occupying the creek beds.

Limestone for the smelting of iron, manufacture of cement, road material, or building purposes outcrops on the Tennessee side of the mountains. Sandstone, some of it suitable for building stone, is exposed in the Cumberland syncline.

Clay and sand occur as alluvial deposits in the Middlesboro basin. Clay is found also under the coal. Much of the clay is suitable for the manufacture of fire brick, paving brick, building brick, and might be utilized for pottery.

Colonel Arthur found the mountains surrounding Middlesboro heavily forested. The principal trees were the chestnut, oaks, yellow poplar, maple, beech, and hickory. In addition to the wood for lumber and wood products, the chestnut oak was present for supplying tannin.

Yellow Creek is the principal source of water for the Middlesboro area. The stream is fed from large springs in the sandstone bedrock. The water tests zero as to hardness. The development of the area has included the damming of Yellow Creek to form Fern Lake with a capacity of 9,000,000 gallons. Additional water could be obtained by drilling artesian wells or piping some of the mountain streams.

EARLY DEVELOPMENT

These resources would have offered little attraction to the British if railroad transportation had not been available. The Louisville and Nashville's Cumberland Valley Branch reached Middlesboro in the fall of 1889, giving communication with Cincinnati and Louisville. A tunnel driven under Cumberland Gap made connection with railroads to Knoxville and points east and north.

With these natural resources, railroad communication, and financial backing, Middlesboro rapidly became a "boom town." The population rose from 50 in May 1889, to 6,200 in August, 1890, 8,200 in January, 1891, to between 10,000 and 15,000 by 1892. Building frontages sold as high as $400 per foot.

The Watts Iron and Steel Company, the principal founders of the city, lost no time in beginning the erection of two iron furnaces and a steel plant. The furnaces each had 300 to 400 tons daily capacity; the steel plant could turn out 700 tons of steel a day. In addition to these and other proposed furnaces were to be numerous factories, including basic steel works, galvanized iron mill and nail works, tannery, wood-working company, furniture company, planing mill, and three fire brick companies. Across the Gap a hotel and casino were planned which in every respect were to surpass the famous spas of Europe.

By 1893 the steel plant was completed, but the depression of that year caused the failure of Baring Brothers, and cut off the money for further development. The iron industry struggled along, but the iron was found to be in scattered beds of irregular size, and so the ore did not prove as economical to mine as had been anticipated. This plus the competition of the Lake Superior iron ores caused the iron industry to be abandoned by 1900. That year saw the population of the city down to 4,162.

THE PRESENT

This was not a permanent setback for Middlesboro. By 1910 the population was 7,305, in 1920 it numbered 8,041, and in 1930, 10,350 were reported. It is the leading mountain city in Kentucky and ranks twelfth in population in the entire state. Middlesboro, however, is not a typical mountain city in that it is not crowded into a narrow valley but occupies a basin which allows expansion in all directions. The layout of the city was planned from the beginning. The streets are wide and regularly laid out. The principal business

street is 100 feet wide, flanked on either side by 20 foot sidewalks. All the parallel streets are 60 feet wide. In the residential section the streets are well shaded and the houses attractive.

The population influx in a typical mountain city is largely drawn from mountain farms, but that of Middlesboro is made up almost entirely of people from other states. Thus, the leading business men moved in from England, Canada, Pennsylvania, Ohio, Indiana, Virginia, and Tennessee.

Tourists have played no small part in keeping Middlesboro progressive. The city lies on a thru route from the North to Florida. Many visit the town because of its proximity to historic Cumberland Gap and to enjoy the beautiful mountain scenery. The tourists not only bring in money but suggest new ideas to the city.

The coal industry has been the principal reason for Middlesboro's continued growth, but Middlesboro is not a typical coal city. The coal mines are far enough removed to eliminate the smoke and dirt associated with this industry. The homes are not the crowded, cheap houses typical of most coal camps. It is the business of handling and marketing the coal that is carried on in Middlesboro. Seventeen electrically equipped coal mines are located within a nine mile radius of the business district and within twelve miles are thirty coal mines. In 1929, 2,871,507 tons of coal were mined in Bell County. Tennessee, North and South Carolina are the nearest markets, the coal being purchased by railroads and industrial plants.

Middlesboro, unlike most Kentucky mountain towns, is not a one-industry city. A tannery, a branch of the U. S. Leather Company, was started in 1891. Tanbark from the surrounding forest was originally utilized; this plus a cheap coal supply and a steady supply of water from a mountain spring were the local resources. At present railroad communication is vital, for the hides come from Argentina, and the local supply of tanbark is supplemented by acorns from Australia. The product, sole and belt leather, is all shipped out of Middlesboro.

A local establishment supplies mining equipment and iron and brass castings of all kinds, and serves the neighboring coal mining section of Tennessee, Virginia, and Kentucky. A company manufacturing overalls, now employing 400 persons, is taking advantage of the wide territory adjacent to Middlesboro where women have few opportunities for commercial employment.

Other minor factories utilize the cheap power, and several

wholesale firms have headquarters in Middlesboro to serve the nearby towns, camp commissaries, and country stores.

THE FUTURE

Middlesboro has prospects for a good future. The city has more than recovered from its early set-back, perhaps not in population numbers but in stability. The city still has room for expansion and is trying to interest outside capital in industries utilizing the natural resources of the section. Middlesboro's future, however, will probably be based on two factors. First, there is coal, 300,000,000 tons of which are estimated to be in the mountains adjacent to the city. The second is the scenery. Good highways, hotels, tourist camps, state parks, and persistent advertising are bringing in more and more tourists to this section.

Middlesboro has proved itself to be no "boom" town. Its importance to the area will continue, altho I anticipate no great growth in size.

A WIND BELT TRANSPARENCY

FLORA M. STAPLE
State Teachers College
Duluth, Minnesota

A wind belt transparency is very helpful in assisting children to reason both inductively and deductively in the study of climatic conditions affected by prevailing winds. A strip of clear waxed paper serves for the foundation, and India ink is good for making the border lines of the wind belts and the arrows indicating the directions in which the winds blow. It is necessary to apply the ink with a rather wide instrument that can be scratched back and forth to remove some of the wax where the lines are drawn. (The filler attached to the cork of an India ink bottle will serve the purpose.) Cellophane, on which lines are drawn with a China-Marking Pencil, is somewhat more expensive but makes a wider, clearer, and more easily constructed transparency than does the waxed paper. The cellophane comes in one hundred inch strips and in twenty-four or thirty inch sheets. The sheets may be pieced together with Scotch Cellulose Tape. If desired a border of this tape may be used to give greater durability. The strip should be much longer than needed for the wind belts, so that it may be hung over a wall map with

enough of the strip hanging back of the map to keep it from too easily falling to the floor while being moved up and down to show seasonal migration of the belts.

Of course a separate transparency is needed for each map with a different scale for degrees of latitude. To be most accurate, one should use this device with maps on which parallels are straight and equally distant one from another at all points. The transparency adapts itself well to the Sinusoidal projection and, sufficiently well for practical use, to the Mercator and Goode's Homolosine projections. Almost any map, however, is satisfactory for the study of the lower latitudes.

COLOMBIA: A CROSS-WORD PUZZLE

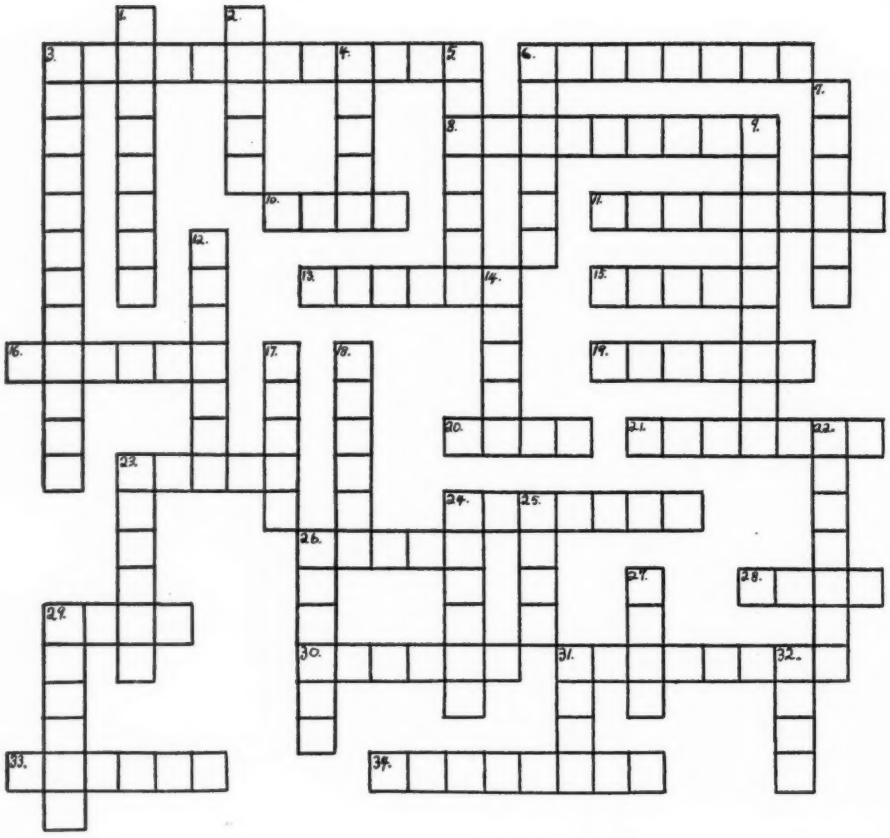
GARNET C. BEARD
Emory and Henry College

Horizontal

3. A port on the Pacific Ocean connected with the city of Cali by railway.
6. A country of South America with a sea-coast on both the Atlantic and Pacific Oceans.
8. The mineral which ranks first in Colombia. It is one of the leading exports.
10. A beautiful wood much used for furniture.
13. An important river flowing into the Caribbean Sea.
15. The river which drains the western mountain range. It is the largest tributary of the Magdalena River.
16. A valuable metal found in small quantities.
19. A forest product essential to the automobile industry.
20. A mineral mined in considerable quantities at Zipaquira, about thirty miles from Bogota.
21. A product cultivated principally in the districts of Santander and Tolima.
23. A wood found in the section of the Sinu River.
24. The first president of the Republic.
26. A tree yielding beans from which chocolate is obtained.
28. A cereal crop grown in the lowlands.
29. The largest city in the productive valley of the Cauca River.
30. The seaport of Barranquilla.
33. The name of the vast wooded areas in the southern part of the region east of the Andean Mountain Range.
34. A valuable metal in the production of which Colombia is seldom excelled.

Vertical

1. The fourth city in size. It is the capital of the Department of Antioquia.
2. An important product grown in all sections of the country up to an altitude of 6,000 or 7,000 feet.
3. The principal port of transshipment for goods destined for the interior.



4. The name of the palm from which ivory nuts are gathered.
5. A product exported from Santander much used in road building.
6. A fiber crop produced along the Pacific coast.
7. The name of the natural pastures in the northern portion of the vast region east of the Andean Mountain Range.
9. The principal river and commercial highway.
12. A valuable gem in the production of which Colombia leads all nations.
14. An early explorer who settled the coast of Colombia.
17. A type of fishing which is a government monopoly.
18. A fruit cultivated principally in the hinterland of Santa Marta.
22. The name of the kingdom which the Indians had established before the coming of the white man.
23. Important livestock of Colombia.
24. The capital city of the Republic.
25. A metal produced in some sections of the country.
26. An abundant but little exported mineral.
27. A valuable metal found in every province.
29. The leading agricultural crop.
31. A cereal crop much cultivated on the Atlantic coast.
32. An ore found abundantly in the Republic.

KEY

Horizontal		Vertical	
3. Buenaventura	21. Tobacco	1. Medellin	18. Banana
6. Colombia	23. Cedar	2. Sugar	22. Chibcha
8. Petroleum	24. Bolivar	3. Barranquilla	23. Cattle
10. Coal	26. Cacao	4. Tagua	24. Bogota
11. Mahogany	28. Rice	5. Asphalt	25. Lead
13. Atrato	29. Cali	6. Cotton	26. Copper
15. Cauca	30. Puerto Colombia	7. Llanos	27. Gold
16. Silver	33. Selvas	9. Magdalena	29. Coffee
19. Rubber	34. Platinum	12. Emerald	31. Corn
20. Salt		14. Ojeda	32. Iron
		17. Pearl	

EDITORIAL NOTES AND NEWS

Last month we presented an excellent paper on the new Czecho-Slovakia. The JOURNAL had scarcely started thru the mails when the life of the new country had been snuffed out. These are days of rapid geographical changes. At the time this is written, Bohemia, Moravia and Memel have been absorbed by Germany, Hungary has occupied Ruthenia, and Slovakia has become a "protectorate" of Germany. You will have to change your maps again, and your textbooks. What will the next change, or changes, be?

A complete new meteorological observatory has been established in the central Sahara by the French. It is under the supervision of the University of Alger, and is located near the small village of Tamanrassett, about 1250 miles south of Alger, and at an altitude of about 4000 feet. It is officially known as the Hoggar Observatory. At present there are three main buildings for scientific use, and one for members of the staff. One building contains the usual meteorological instruments and photographic laboratory; another the magnetic instruments for study of terrestrial magnetism; and the third shelters the wireless and radio equipment.

Teachers will find highly useful Leaflet No. 31, entitled "Government Publications of Use to Teachers of Geography and Science" issued recently by the U. S. Office of Education. It may be obtained from the Government Printing Office for ten cents.

The widespread interest expressed in the 53-day Rotterdam Cruise to Rio de Janiero next July, in conjunction with the Eighth Biennial Congress of the World Federation of Education Associations, August 6-11, has led to chartering of a second ship, *The Argentina of American Republics*. Specially arranged for teachers planning to attend summer school, the 36-day cruise of the Argentina will leave New York July 26, and return to New York September 2. During the Congress at Rio, passengers will use the *Argentina* as their hotel, then visit Santos, Montevideo, and Buenos Aires. Tourist class fares are as low as $410 for the entire cruise. For further information, write to the W.F.E.A. Travel Bureau, 1201 Sixteenth Street, N.W., Washington, D.C.

Reports indicate that the President of Brazil recently signed a decree-law establishing a National Park of the Iguassu Falls and surrounding locality.

Since old maps cannot always be scrapped for new ones, the map user may have to mentally supply the changes which a new map of 1939 would reveal. Newspapers and magazines have generously supplied maps showing boundaries of Germany, Hungary, Rumania, Slovakia, Bolivia, Paraguay, and the Japanese conquests in China. Here are a few other changes or achievements of 1938 easy to note on the average map your equipment provides. Orenburg, a city of 140,000 on the Ural River, has had its name changed to Chkaloff, thus honoring the Russian aviator who made the non-stop flight in 1937 from Moscow over the North Pole to the United States. A new city, Carbonia, appears on the map of Sardinia, made-to-order to develop the coal mines of that highly mineralized island, significant to Italy's industrialization. The workers have been producing coal at Carbonia at the rate of about 60,000 tons a month. Italian East Africa replaces Ethiopia. Hatay emerges as a new autonomous unit among Levant States on the northeastern Mediterranean, on territory formerly known as Sanjak of Alexandretta. Antioch is the capital of that new republic which includes the port of Alexandretta, and extends for a hundred miles along the Gulf of Alexandretta. Australia's capital city is designated Canberra, A.C.T., the letters standing for "Australian Capital Territory," in place of the former "Federal Capital Territory," often confused with Brazil's Federal District and Mexico's Federal District. Southwest of Calcutta looms a new capital-city site, Cuttack Chowdwar, administrative center of the new province of Orissa. A new 400 mile highway connects Lashio, northeast of Mandalay, with Yunnanfu, making shipments possible between Rangoon and Yunnan Province. Lashio is at the terminus of a rail line from Rangoon. More than a hundred thousand coolies have pushed the construction of this significant international highway along which the Chinese can truck European and American supplies and be relatively secure from Japanese attacks concentrated in eastern China. Another far-reaching transportation hookup is that afforded by the new 865 mile Trans-Iran Railway between the Persian Gulf and the Caspian Sea via Tehran.

Suggestive achievements to be added to the map include the discovery from the air by Bradford Washburn of a great ice field, source of several large glaciers, northwest of Juneau; also, the discoveries of Louise Boyd and her party of six who reached 77° 50′ N. and 17° 10′ W., the highest latitude on the Greenland coast attained by an American ship. At least this new canal and diversion dam should be added to your 1939 mental map: the 80-mile long All American Canal which carries more than half of the water of the Lower Colorado River thru a desert to the Imperial Valley of southeastern California. The Imperial Dam which diverts this water is about 20 miles upstream from Yuma.

Distance as viewed on the map of 1939 also needs mental revision. Thus, the Queen Mary in August crossed the Atlantic from New York eastbound in 3 days, 21 hours, and 48 minutes and clipped off another hour on the return to New York. Howard Hughes in July encircled the globe in 3 days, 19 hours, and 17 minutes in a flight of 14,824 miles. Bombing planes and other military planes have made incredible speeds, altitudes, and long distance records. These and many other changes are suggestive of what you can envision on your old maps to help keep you abreast of the times.

The New England Geographical Conference holds its sixteenth annual meeting at Clark University, April 28-29. Dr. Ellsworth Huntington will speak on the Balkans; Dr. George H. Blakeslee, on the Far East; Robert M. Brown, on a new approach to geography teaching; Dr. Young, Superintendent of Schools in Worcester, on geography in the public schools; President Atwood, on geography in education; Mr. McCune, on Korea; Mr. Ching Yuan Li, on bases of the Japanese campaigns in China; Mr. Lloyd, on the status of geography in Great Britain; Miss Gregory, on the status of geography in Teachers Colleges of New England; Miss Lamson, on Landscapes in Yugoslavia; and Dr. Atwood, Jr., and Eugene Kingman will have paintings and motion pictures of Crater Lake and Yosemite. The dinner, luncheon, and tea provide opportunity for social contacts and informal discussions.